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# Analytical Standards for Medicinal and Recreational Cannabis Standards

- Cannabis Pesticide Mixes and Kits
- Terpenes and Flavonoids
- Mycotoxins
- Cannabinoids and DEA Controlled Substances
- Residual Solvents
- Heavy Metal Standards

EMERALD SCIENTIFIC

EmeraldScientific.com
Sales@EmeraldScientific.com
(877) 567-3598 x1

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# Analytical Standards for Cannabis Testing

The legalization of cannabis, for both medicinal and recreational purposes, has been gaining speed, yet legislation and regulation have not necessarily kept pace. Even so, out of a drive for self-regulation and significant consumer safety concerns, many producers and manufacturers are turning to testing labs in order to ensure that their products are high quality and free of chemical contaminants. Spex CertiPrep offers ISO 17034 Certified Reference Materials (CRMs) for all of the common contaminants such as pesticide residues, residual solvents and heavy metals, as well as qualitative analysis CRMs such as terpenes. As the industry demands change and regulations are put into place, we continually update our product offerings.

Designed for methods: state specific pesticide regulations: OAR 333-008-11, HB 3460, AOAC 2007.01, EN 15662.

Organic and Inorganic
Certified Reference Materials

Analytical Standards for
Cannabis Testing

Supplied with a
Certificate of Analysis


ISO Accredited
Standards

| Pesticide Residues | | | | |
|---|---|---|---|---|
| **Description** | **Concentration** | **Volume** | **Matrix** | **Part #** |
| Organochlorine Pesticides Mix A, 18 compounds | 200 µg/mL | 1 mL | Acetone | 5252-PA |
| Organochlorine Pesticides Mix B, 15 compounds | 200 µg/mL | 1 mL | Acetone | 5252-PB |
| Nitrogen-Phosphorus Pesticides Mix D, 9 compounds | 200 µg/mL | 1 mL | Acetone | 5252-PD |
| Nitrogen-Phosphorus Pesticides Mix E, 3 compounds | 200 µg/mL | 1 mL | Acetone | 5252-E |
| Organochlorine Pesticides Mix | 2,000 µg/mL | 1 mL | Benzene | 625-PH |

| Massachusetts Cannabis Pesticide Residue Mix 1 in LC/MS Acetonitrile | | | |
|---|---|---|---|
| **Component** | **CAS #** | **Component** | **CAS #** |
| Bifenazate | 149877-41-8 | Imidacloprid | 138261-41-3 |
| Bifenthrin | 82657-04-3 | Systhane (Myclobutanil) | 88671-89-0 |
| Baythroid (Cyfluthrin) | 68359-37-5 | Spiromesifen | 283594-90-1 |
| Etoxazole | 153233-91-1 | Trifloxystrobin | 141517-21-7 |
| Imazalil | 35554-44-0 | | |

| Concentration | Volume | Part # |
|---|---|---|
| 100 µg/mL | 1 mL | MA-CAN-1 |

| Massachusetts Cannabis Pesticide Residue Mix 2 in LC/MS Acetonitrile | | | |
|---|---|---|---|
| **Component** | **CAS #** | **Component** | **CAS #** |
| Abamectin | 71751-41-2 | lambda-Cyhalothrin | 91465-08-6 |
| Azadirachtin | 11141-17-6 | Paclobutrazol | 76738-62-0 |
| Azoxystrobin | 131860-33-8 | Permethrin | 52645-53-1 |
| Boscalid | 188425-85-6 | Piperonyl butoxide | 51-03-6 |
| Carbaryl | 63-25-2 | Pyrethrins (mix of isomers) | 8003-34-7 |
| Chlorfenapyr | 122453-73-0 | Spinosad | 168316-95-8 |
| Dinotefuran | 165252-70-0 | Spirotetramat | 203313-25-1 |

| Concentration | Volume | Part # |
|---|---|---|
| 100 µg/mL | 1 mL | MA-CAN-2 |

| Carbamate Pesticides | | | | | |
|---|---|---|---|---|---|
| **Component** | **CAS #** | **Concentration** | **Volume** | **Matrix** | **Part #** |
| Analyte Mix A | Multiple | 100 µg/mL | 1 mL | Acetonitrile | 5311-A10 |

| Pyrethroids/Pesticides | | | | | |
|---|---|---|---|---|---|
| **Component** | **CAS #** | **Concentration** | **Volume** | **Matrix** | **Part #** |
| Allethrin | 584-79-2 | 1,000 µg/mL | 1 mL | Methanol-P&T | S-4240 |
| Bifenthrin | 82657-04-3 | 1,000 µg/mL | 1 mL | Acetone | S-494 |
| Bifenthrin | 82657-04-3 | 1,000 µg/mL | 1 mL | Acetonitrile | S-494-ACN |
| Deltamethrin | 52918-63-5 | 1,000 µg/mL | 1 mL | Methanol-P&T | S-3977 |
| Fenpropathrin | 39515-41-8 | 1,000 µg/mL | 1 mL | Acetone | S-5781 |
| tau-Fluvalinate | 102851-06-9 | 1,000 µg/mL | 1 mL | Acetone | S-4161 |
| trans-Permethrin (mix of isomers) | 61949-77-7 | 1,000 µg/mL | 1 mL | Acetone | S-5732 |
| d-(cis-trans)-Phenothrin | 26002-80-2 | 1,000 µg/mL | 1 mL | Acetone | S-3041 |
| Prallethrin | 23031-36-9 | 1,000 µg/mL | 1 mL | Acetonitrile | LCS-5783 |
| Resmethrin | 10453-86-8 | 1,000 µg/mL | 1 mL | Acetone | S-3252 |
| Tetramethrin | 7696-12-0 | 1,000 µg/mL | 1 mL | Acetone | S-4251-AC |
| Tetramethrin | 7696-12-0 | 1,000 µg/mL | 1 mL | Methanol-P&T | S-4251 |

| Pesticide Singles | | | | | |
|---|---|---|---|---|---|
| **Component** | **CAS #** | **Concentration** | **Volume** | **Matrix** | **Part #** |
| Bifenazate | 149877-41-8 | 1,000 µg/mL | 1 mL | Acetonitrile | S-6082 |
| Carbaryl | 63-25-2 | 1,000 µg/mL | 1 mL | Acetonitrile | S-725 |
| Chlormequat chloride | 999-81-5 | 1,000 µg/mL | 1 mL | HPLC Acetonitrile | LCS-4838 |
| Daminozide | 1596-84-5 | 1,000 µg/mL | 1 mL | LC/MS Methanol | LCS-6654 |
| Flubendiamide | 272451-65-7 | 1,000 µg/mL | 1 mL | HPLC Acetonitrile | LCS-5773-ACN |
| Imidacloprid | 138261-41-3 | 1,000 µg/mL | 1 mL | Acetone | S-2247 |
| Maltodextrin | 9050-36-6 | 1,000 µg/mL | 1 mL | HPLC Grade Water | LCS-5705 |
| Maltose | 6363-53-7 | 1,000 µg/mL | 1 mL | HPLC Grade Water | LCS-4188 |
| beta-Myrcene | 123-35-3 | 1,000 µg/mL | 1 mL | Methanol | S-2654-MEOH |
| Paclobutrazol | 76738-62-0 | 1,000 µg/mL | 1 mL | HPLC Acetonitrile | LCS-4345-ACN |
| Permethrin (cis & trans) | 52645-53-1 | 1,000 µg/mL | 1 mL | Acetone | S-3000 |
| Piperonyl butoxide | 51-03-6 | 1,000 µg/mL | 1 mL | HPLC Acetonitrile | LCS-3117-ACN |
| Pyrethrins (mix of isomers) | 8003-34-7 | 1,000 µg/mL | 1 mL | Acetonitrile | S-5506-ACN |
| Systhane (Myclobutanil) | 88671-89-0 | 1,000 µg/mL | 1 mL | HPLC Acetone | LCS-3306 |

# AOAC Pesticide Standards

AOAC International started as the Association of Official Agricultural Chemists over a century ago and continues to serve as one of the primary method and standard developers for the analytical community when it comes to the area of agriculture. Their activities cover the safety of food and beverages, dietary supplements, feeds, soil, water, veterinary drugs, and other aspects of the agricultural process. Over the last few years, AOAC has issued guidance for screening pesticides in cannabis. Spex CertiPrep AOAC standards reflect the list of pesticides under scrutiny for cannabis testing.

| AOAC Pesticide Standards | |
|---|---|
| **Component** | **Part #** |
| AOAC Pesticide Mix 1 with 23 components, 100 µg/mL in LC/MS Acetonitrile, 1 mL | AOAC-PEST-1 |
| AOAC Pesticide Mix 2 with 12 components, 100 µg/mL in LC/MS Acetonitrile, 1 mL | AOAC-PEST-2 |
| AOAC Pesticide Mix 3 with 14 components, 100 µg/mL in LC/MS Acetonitrile, 1 mL | AOAC-PEST-3 |
| AOAC Pesticide Mix 4 with 16 components, 100 µg/mL in LC/MS Acetonitrile, 1 mL | AOAC-PEST-4 |
| AOAC Pesticide Mix 5 with 5 components, 100 µg/mL in LC/MS Acetonitrile, 1 mL | AOAC-PEST-5 |
| AOAC Pesticide Mix 6, Dibrom (Naled), 100 µg/mL in HPLC Acetonitrile, 1 mL | AOAC-PEST-6 |

# USP <561> Standards

## USP General Chapter <561> Articles of Botanical Origin

The United States Pharmacopeia (USP) creates standards for the monitoring of pharmaceutical and botanical products. General Chapter <561> Articles of Botanical Origin outlines tests and specifications for the safety of botanical products. The chapter defines sampling procedures and tests for general characteristics for moisture, ash, starch and fiber. The chapter also describes methods for extractables and volatile compounds. In the interests of safety, USP <561> has procedures for the testing of targeted pesticides and Spex CertiPrep provides standards for that testing under the General Chapter <561>.

**USP <561> Mix A in Acetonitrile**

| Component | CAS # | Component | CAS # | Component | CAS # |
|---|---|---|---|---|---|
| Dimethyl-p-Nitrophenylphosphate | 950-35-6 | Permethrin | 52645-53-1 | Pyrethrins (mix of isomers) | 8003-34-7 |
| Imidan (Phosmet) | 732-11-6 | Phosalone | 2310-17-0 | Quinalphos | 13593-03-8 |
| Methyl parathion | 298-00-0 | Piperonyl butoxide | 51-03-6 | 1,2,4,5-Tetrachloro-3-nitrobenzene | 117-18-0 |
| N-Desethyl-primiphos-methyl | 67018-59-1 | Pirimiphos-ethyl | 23505-41-1 | Bis(2,3,3,3-tetrachloropropyl) ether (S421) | 127-90-2 |
| Paraoxon | 311-45-5 | Pirimiphos-methyl | 29232-93-7 | Tetradifon | 116-29-0 |
| Pentachloroaniline | 527-20-8 | Procymidone | 32809-16-8 | Tokuthion/Prothiophos | 34643-46-4 |
| 2,3,4,5,6-Pentachloroanisole | 1825-21-4 | Profenofos | 41198-08-7 | | |
| Pentachloronitrobenzene | 82-68-8 | Prowl (Pendimethalin) | 40487-42-1 | | |

| Concentration | Volume | Part # |
|---|---|---|
| 100 µg/mL | 1 mL | USP-561-A |

## USP <561> Mix B in Acetonitrile

| Component | CAS # | Component | CAS # | Component | CAS # |
|---|---|---|---|---|---|
| alpha-BHC | 319-84-6 | Heptachlor | 76-44-8 | Methoxychlor | 72-43-5 |
| beta-BHC | 319-85-7 | Heptachlor epoxide (Isomer A) | 28044-83-9 | Mirex | 2385-85-5 |
| delta-BHC | 319-86-8 | Heptachlor epoxide (Isomer B) | 1024-57-3 | Monocrotophos | 6923-22-4 |
| gamma-BHC | 58-89-9 | Hexachlorobenzene | 118-74-1 | Parathion | 56-38-2 |
| Endosulfan sulfate | 1031-07-8 | Malaoxon | 1634-78-2 | Vinclozolin | 50471-44-8 |
| Endrin | 72-20-8 | Malathion | 121-75-5 | | |
| Etrimfos | 38260-54-7 | Methamidophos | 10265-92-6 | | |
| tau-Fluvalinate | 102851-06-9 | Methidathion | 950-37-8 | | |

| Concentration | Volume | Part # |
|---|---|---|
| 100 µg/mL | 1 mL | USP-561-B |

## USP <561> Mix C in Acetonitrile

| Component | CAS # | Component | CAS # | Component | CAS # |
|---|---|---|---|---|---|
| Acarol (Bromopropylate) | 18181-80-1 | Chlorpyrifos-ethyl | 39475-55-3 | Fenchlorphos | 299-84-3 |
| Azinphos-ethyl | 2642-71-9 | Chlorpyrifos-methyl | 5598-13-0 | Fenitrothion | 122-14-5 |
| Azinphos-methyl | 86-50-0 | lambda-Cyhalothrin | 91465-08-6 | Fensulfothion | 115-90-2 |
| Baythroid (Cyfluthrin) | 68359-37-5 | Cypermethrin | 52315-07-8 | Fenthion | 55-38-9 |
| Bromophos-ethyl | 4824-78-6 | Dichlofluanid | 1085-98-9 | Kelthane (Dicofol) | 115-32-2 |
| Bromophos-methyl | 2104-96-3 | Dyfonate (Fonofos) | 944-22-9 | Sanmarton | 51630-58-1 |
| Chlorfenvinfos | 470-90-6 | Ethion | 563-12-2 | | |

| Concentration | Volume | Part # |
|---|---|---|
| 100 µg/mL | 1 mL | USP-561-C |

## USP <561> Mix D in Acetonitrile

| Component | CAS # | Component | CAS # | Component | CAS # |
|---|---|---|---|---|---|
| Acephate | 30560-19-1 | o,p'-DDT | 789-02-6 | Dieldrin | 60-57-1 |
| Alachlor | 15972-60-8 | p,p'-DDD | 72-54-8 | Dimethoate | 60-51-5 |
| Aldrin | 309-00-2 | p,p'-DDE | 72-55-9 | Endosulfan I | 959-98-8 |
| alpha-Chlordane | 5103-71-9 | p,p'-DDT | 50-29-3 | Endosulfan II | 33213-65-9 |
| gamma-Chlordane | 5103-74-2 | Deltamethrin | 52918-63-5 | Omethoate | 1113-02-6 |
| o,p'-DDD | 53-19-0 | Diazinon | 333-41-5 | Oxychlordane | 27304-13-8 |
| o,p'-DDE | 3424-82-6 | Dichlorvos | 62-73-7 | | |

| Concentration | Volume | Part # |
|---|---|---|
| 100 µg/mL | 1 mL | USP-561-D |

## USP <561> Mix E in LC/MS Acetonitrile

| Component | CAS # | Component | CAS # | Component | CAS # |
|---|---|---|---|---|---|
| Fenchlorophos-oxon | 3983-45-7 | Fenthion sulfoxide | 3761-41-9 | Flucythrinate | 70124-77-5 |
| Fenpropathrin | 39515-41-8 | Fenthion-oxon | 6552-12-1 | Mecarbam | 2595-54-2 |
| Fensulfothion-oxon | 6552-21-2 | Fenthion-oxon-sulfone | 14086-35-2 | Methacrifos | 62610-77-9 |
| Fensulfothion-oxon-sulfone | 6132-17-8 | Fenthion-oxon-sulfoxide | 6552-13-2 | Methyl pentachlorophenyl sulfide | 1825-19-0 |
| Fensulfothion-sulfone | 14255-72-2 | Fenthion-sulfone | 3761-42-0 | | |

| Concentration | Volume | Part # |
|---|---|---|
| 100 µg/mL | 1 mL | USP-561-E |

## USP <561> Mix F in Acetonitrile

| Component | CAS # |
|---|---|
| Ziram | 137-30-4 |

| Concentration | Volume | Part # |
|---|---|---|
| 100 µg/mL | 1 mL | USP-561-F |

## USP <561> Mix G in Toluene

| Component | CAS # |
|---|---|
| Epsilon-HCH | 6108-10-7 |

| Concentration | Volume | Part # |
|---|---|---|
| 100 µg/mL | 1 mL | USP-561-G |

# Cannabis Terpenes

| Terpenes | | | | | |
|---|---|---|---|---|---|
| **Component** | **CAS #** | **Concentration** | **Volume** | **Matrix** | **Part #** |
| Bisabolene | 495-62-5 | 1,000 µg/mL | 1 mL | Methanol-P&T | S-502 |
| (-)-alpha-Bisabolol | 23089-26-1 | 1,000 µg/mL | 1 mL | Methanol | S-7598 |
| Borneol | 507-70-0 | 1,000 µg/mL | 1 mL | Methanol-P&T | S-4570 |
| (+)-Borneol | 464-43-7 | 1,000 µg/mL | 1 mL | Methanol-P&T | S-5093 |
| (-)-Borneol | 464-45-9 | 1,000 µg/mL | 1 mL | Methanol | S-7587 |
| D-Camphene | 5794-03-6 | 1,000 µg/mL | 1 mL | Methanol-P&T | S-710 |
| Camphene (mix of isomers) | 79-92-5 | 1,000 µg/mL | 1 mL | Methanol | S-7599 |
| Camphor | 76-22-2 | 1,000 µg/mL | 1 mL | Methanol-P&T | S-3925 |
| (1R)-(+)-Camphor | 464-49-3 | 1,000 µg/mL | 1 mL | Methanol | S-7600 |
| (1S)-(-)-Camphor | 464-48-2 | 1,000 µg/mL | 1 mL | Methanol | S-7601 |
| 3-Carene | 13466-78-9 | 1,000 µg/mL | 1 mL | Methanol-P&T | S-4171 |
| (1S)-(+)-3-Carene | 498-15-7 | 1,000 µg/mL | 1 mL | Methanol | S-7602 |
| trans-Caryophyllene | 87-44-5 | 1,000 µg/mL | 1 mL | Methanol | S-5690 |
| (-)-Caryophyllene oxide | 1139-30-6 | 1,000 µg/mL | 1 mL | Methanol | S-7584 |
| alpha-Cedrene | 469-61-4 | 1,000 µg/mL | 1 mL | Methanol | S-5691 |
| (+)-Cedrol | 77-53-2 | 1,000 µg/mL | 1 mL | Methanol | S-7603 |
| Citronellol | 106-22-9 | 1,000 µg/mL | 1 mL | Methanol-P&T | S-4868 |
| (1R)-endo-(+)-Fenchyl alcohol | 2217-02-9 | 1,000 µg/mL | 1 mL | Methanol | S-7604 |
| 2-Ethyl-Fenchol | 18368-91-7 | 1,000 µg/mL | 1 mL | Ethanol | S-4952 |
| Ethylenediamine | 107-15-3 | 1,000 µg/mL | 1 mL | HPLC Grade Water | LCS-1961 |
| Eucalyptol | 470-82-6 | 1,000 µg/mL | 1 mL | Methanol | S-4352 |
| Farnese (mix of isomers) | 502-61-4 | 1,000 µg/mL | 1 mL | Methanol-P&T | S-1989 |
| Fenchone | 1195-79-5 | 1,000 µg/mL | 1 mL | Methanol-P&T | S-4569 |
| (+)-Fenchone | 4695-62-9 | 1,000 µg/mL | 1 mL | Methanol | S-7585 |
| L(-)-Fenchone | 7787-20-4 | 1,000 µg/mL | 1 mL | Methanol-P&T | S-5091 |
| Geraniol | 106-24-1 | 1,000 µg/mL | 1 mL | Methanol-P&T | S-4866 |
| Geranyl acetate | 105-87-3 | 1,000 µg/mL | 1 mL | Methanol | S-7605 |
| Guaiol | 489-86-1 | 1,000 µg/mL | 1 mL | Methanol-P&T | S-5698 |
| Hexahydrothymol | 89-78-1 | 1,000 µg/mL | 1 mL | Methanol | S-7588 |
| alpha-Humulene | 6753-98-6 | 1,000 µg/mL | 1 mL | Methanol | S-5692 |
| Isobomeol | 124-76-5 | 1,000 µg/mL | 1 mL | Methanol | S-4674 |
| Isoprene | 78-79-5 | 1,000 µg/mL | 1 mL | Methanol-P&T | S-2300 |
| p-Isopropyltoluene | 99-87-6 | 1,000 µg/mL | 1 mL | Methanol-P&T | S-2320 |
| (-)-Isopulegol | 89-79-2 | 1,000 µg/mL | 1 mL | Methanol | S-7606 |
| (R)-(+)-Limonene | 5989-27-5 | 1,000 µg/mL | 1 mL | Methanol-P&T | S-4021 |

| **Terpenes** (continued) | | | | | |
|---|---|---|---|---|---|
| **Component** | **CAS #** | **Concentration** | **Volume** | **Matrix** | **Part #** |
| Linalool | 78-70-6 | 1,000 µg/mL | 1 mL | Methanol | S-5133 |
| Maltitol | 585-88-6 | 1,000 µg/mL | 1 mL | LCMS Grade Water | LCS-4348 |
| Maltotriose | 1109-28-0 | 1,000 µg/mL | 1 mL | HPLC Grade Water | LCS-4859 |
| p-Mentha-1,5-diene | 99-83-2 | 1,000 µg/mL | 1 mL | Methanol | S-4173 |
| Menthol | 2216-51-5 | 1,000 µg/mL | 1 mL | Methanol-P&T | S-4669 |
| beta-Myrcene | 123-35-3 | 1,000 µg/mL | 1 mL | Hexane | S-2654 |
| Nerol | 106-25-2 | 1,000 µg/mL | 1 mL | Methanol | S-7607 |
| cis-Nerolidol | 3790-78-1 | 1,000 µg/mL | 1 mL | Methanol | S-7608 |
| trans-Nerolidol | 40716-66-3 | 1,000 µg/mL | 1 mL | Methanol | S-7609 |
| Ocimene (mix of isomers) | 13877-91-3 | 1,000 µg/mL | 1 mL | Methanol | S-7515 |
| alpha-Pinene | 80-56-8 | 1,000 µg/mL | 1 mL | Methanol-P&T | S-4172 |
| beta-Pinene | 127-91-3 | 1,000 µg/mL | 1 mL | Methanol-P&T | S-3142 |
| (+)-Pulegone | 89-82-7 | 1,000 µg/mL | 1 mL | Methanol | S-5136 |
| Sabinene | 3387-41-5 | 1,000 µg/mL | 1 mL | Methanol | S-6645 |
| Sabinene hydrate | 546-79-2 | 1,000 µg/mL | 1 mL | Methanol | S-7610 |
| Terpineol (mix of isomers) | 8000-41-7 | 1,000 µg/mL | 1 mL | Methanol | S-7611 |
| alpha-Terpineol | 10482-56-1 | 1,000 µg/mL | 1 mL | Acetone | S-3356-AC |
| alpha-Terpineol | 98-55-5 | 1,000 µg/mL | 1 mL | Methanol-P&T | S-4145 |
| alpha-Terpinene | 99-86-5 | 1,000 µg/mL | 1 mL | Methanol | S-5687 |
| gamma-Terpinene | 99-85-4 | 1,000 µg/mL | 1 mL | Methanol | S-5688 |
| 2,6,10,14-Tetramethylpentadecane | 1921-70-6 | 1,000 µg/mL | 1 mL | Tetrachloroethylene | LCS-3125-TETCHET |
| Valencene | 4630-07-3 | 1,000 µg/mL | 1 mL | Methanol | S-7612 |

| **CAN-TERP Mix 1 in Methanol** | | | | | |
|---|---|---|---|---|---|
| **Component** | **CAS #** | **Component** | **CAS #** | **Component** | **CAS #** |
| (-)-alpha-Bisabolol | 23089-26-1 | Eucalyptol | 470-82-6 | Linalool | 78-70-6 |
| Camphene | 79-92-5 | Farnesene (mix of isomers) | 502-61-4 | p-Mentha-1,5-diene | 99-83-2 |
| Camphor | 76-22-2 | (+)-Fenchone | 4695-62-9 | beta-Myrcene | 123-35-3 |
| (1S)-(+)-3-Carene | 498-15-7 | Geranyl acetate | 105-87-3 | Nerol | 106-25-2 |
| (-)-Caryophyllene oxide | 1139-30-6 | Hexahydrothymol | 89-78-1 | cis-Nerolidol | 3790-78-1 |
| trans-Caryophyllene | 87-44-5 | Isoborneol | 124-76-5 | Ocimene (mix of isomers) | 13877-91-3 |
| (+)-Cedrol | 77-53-2 | (-)-Isopulegol | 89-79-5 | Valencene | 4630-07-3 |

| **Concentration** | **Volume** | **Part #** |
|---|---|---|
| 100 µg/mL | 1 mL | CAN-TERP-MIX1 |

| **Concentration** | **Volume** | **Part #** |
|---|---|---|
| 1,000 µg/mL | 1 mL | CAN-TERP-MIX1H |

## CAN-TERP Mix 2 in Methanol

| Component | CAS # | Component | CAS # | Component | CAS # |
|---|---|---|---|---|---|
| (+)-Borneol | 464-43-7 | Geraniol | 106-24-1 | (+)-Pulegone | 89-82-7 |
| (-)-Borneol | 464-45-9 | Guaiol | 489-86-1 | alpha-Terpinene | 99-86-5 |
| (1R)-(+)-Camphor | 464-49-3 | alpha-Humulene | 6753-98-6 | gamma-Terpinene | 99-85-4 |
| (1S)-(-)-Camphor | 464-48-2 | (R)-(+)-Limonene | 5989-27-5 | Terpinolene | 586-62-9 |
| alpha-Cedrene | 469-61-4 | trans-Nerolidol | 40716-66-3 | Terpineol (mix of isomers) | 8000-41-7 |
| L(-)-Fenchone | 7787-20-4 | alpha-Pinene | 80-56-8 | Sabinene | 3387-41-5 |
| (1R)-endo-(+)-Fenchyl alcohol | 2217-02-9 | beta-Pinene | 127-91-3 | Sabinene hydrate | 546-79-2 |

| Concentration | Volume | Part # |
|---|---|---|
| 100 µg/mL | 1 mL | CAN-TERP-MIX2 |

| Concentration | Volume | Part # |
|---|---|---|
| 1,000 µg/mL | 1 mL | CAN-TERP-MIX2H |

## CAN-TERP Kit in Methanol

| Kit Contains | |
|---|---|
| CAN-TERP-MIX1 | CAN-TERP-MIX2 |

| Concentration | Volume | Part # |
|---|---|---|
| 100 µg/mL | 1 mL | CAN-TERP-KIT |

## CAN-TERP Kit (High Level) in Methanol

| Kit Contains | |
|---|---|
| CAN-TERP-MIX1H | CAN-TERP-MIX2H |

| Concentration | Volume | Part # |
|---|---|---|
| 1,000 µg/mL | 1 mL | CAN-TERP-KIT-H |

# Flavonoid Standards and Compound Mix

Flavonoids are naturally occurring secondary metabolic products that can have important functions within plants and benefit consumers with health and healing properties. Similar to terpenes, flavonoids share a role in how we perceive cannabis through our senses. Flavonoids are not unique to the cannabis plant. They have been identified in nature, from flowers to fruits and vegetables. Researchers have started to investigate the potential therapeutic properties of individual cannabis flavonoids.

Many beneficial compounds are metabolites produced as an end product of chemical and biological processes. Metabolites are small molecules that have many functions including defense, pigments, pheromones, odorants and catalysts. Primary metabolites are necessary for growth, development and reproduction. Flavonoids are secondary plant, algae or fungus metabolites composed of polyphenolic compounds. Secondary metabolites are not directly involved in critical processes but have secondary functions involving defense and pigmentation. We offer analytical standards for flavonoid analysis.

| Flavonoid Standard Compound Mix | | | | | |
|---|---|---|---|---|---|
| **Component** | **CAS #** | **Concentration** | **Volume** | **Matrix** | **Part #** |
| Apigenin | 520-36-5 | 1,000 µg/mL | 1 mL | Dimethyl Sulfoxide | FLAVIN-1 |
| Baicalin | 21967-41-9 | | | | |
| (+)-Catechin | 154-23-4 | | | | |
| Catechol | 120-80-9 | | | | |
| Chrysin | 480-40-0 | | | | |
| (-)-Epicatechin | 490-46-0 | | | | |
| Epigallocatechin | 989-51-5 | | | | |
| Isovitexin | 38953-85-4 | | | | |
| Kaempferol | 520-18-3 | | | | |
| Luteolin | 491-70-3 | | | | |
| Myricetin | 529-44-2 | | | | |
| Orientin | 28608-75-5 | | | | |
| Quercetin | 117-39-5 | | | | |
| Rutin | 153-18-4 | | | | |
| Vitexin | 3681-93-4 | | | | |

We offer the additional analytical standards listed below for flavonoid analysis. Contact the Emerald Scientific team at 877.567.3598 x1 or via email at Sales@EmeraldScientific.com for details and to discuss your specific requirements.

| Analytical Standards for Flavonoid Analysis | |
|---|---|
| **Component** | **CAS #** |
| Apigenin | 520-36-5 |
| +/- Catechin (as catechin hydrate) | 7295-85-4 |
| Catechol | 120-80-9 |
| (-)-Epicatechin | 490-46-0 |
| (-)-Epigallocatechin | 970-74-1 |
| Kaempferol | 520-18-3 |
| Luteolin | 491-70-3 |
| Myricetin | 529-44-2 |
| Quercetin | 117-39-5 |
| Vitexin | 3681-93-4 |

# Cannabinoids and DEA Controlled Substances

| Cannabinoids and DEA Controlled Substances | | | | | |
|---|---|---|---|---|---|
| **Component** | **CAS #** | **Concentration** | **Volume** | **Matrix** | **Part #** |
| Cannabidiol (CBD) | 13956-29-1 | 1,000 µg/mL | 1 mL | Methanol | S-10241 |
| Cannabinol (CBN) | 521-35-7 | 1,000 µg/mL | 1 mL | Methanol | S-10242 |
| Cannabidivarin (CBDV) | 24274-48-4 | 1,000 µg/mL | 1 mL | Methanol | S-10245 |
| Cannabigerol (CBG) | 2808-33-5 | 1,000 µg/mL | 1 mL | Methanol | S-10246 |
| Cannabigerolic acid (CBGA) | 25555-57-1 | 1,000 µg/mL | 1 mL | Acetonitrile | S-10247 |
| Cannabichromene (CBC) | 20675-51-8 | 1,000 µg/mL | 1 mL | Methanol | S-10248 |
| Cannabidolic acid (CBDA) | 1244-58-2 | 1,000 µg/mL | 1 mL | Acetonitrile | S-10249 |
| (-)-delta9-THC | 1972-08-3 | 1,000 µg/mL | 1 mL | Methanol | S-10260 |
| (-)-delta8-THC | 5957-75-5 | 1,000 µg/mL | 1 mL | Methanol | S-10261 |
| Tetrahydrocannabinolic acid (THCA) | 23978-85-0 | 1,000 µg/mL | 1 mL | Acetonitrile | S-11056 |
| Tetrahydrocannabivarin (THCV) | 31262-37-0 | 1,000 µg/mL | 1 mL | Methanol | S-11057 |

# Mycotoxins

Mold and fungi are all over the world and are of major concern in agricultural products. Fungi and their spores can spread throughout crops and food stores tainting crops. Fungi can proliferate into colonies with the right environmental conditions which destroy crops by consuming them or poison them with toxic secondary metabolites called mycotoxins.

Spex CertiPrep offers an analytical standard mix of five of the most commonly tested mycotoxins (four aflatoxins and ochratoxin A) for your mycotoxin testing needs. Our mycotoxins are ISO 17034 accredited. Custom standards are also available.

| Mycotoxins Standard Mix | | | | | |
|---|---|---|---|---|---|
| **Component** | **CAS #** | **Concentration** | **Volume** | **Matrix** | **Part #** |
| Aflatoxin B1 | 1162-65-8 | 10 µg/mL of each compound | 1 mL | Acetonitrile | MYCO-1 |
| Aflatoxin B2 | 7220-81-7 | | | | |
| Aflatoxin G1 | 1165-39-5 | | | | |
| Aflatoxin G2 | 7241-98-7 | | | | |
| Ochratoxin A | 303-47-9 | | | | |

# Residual Solvents

| Residual Solvents | | | | | |
|---|---|---|---|---|---|
| **Component** | **CAS #** | **Concentration** | **Volume** | **Matrix** | **Part #** |
| Acetone | 67-64-1 | 1,000 µg/mL | 1 mL | Methanol-P&T | S-140 |
| Anisole | 100-66-3 | 1,000 µg/mL | 1 mL | Methanol | S-288 |
| n-Butane | 106-97-8 | 1,000 µg/mL | 1 mL | Methanol-P&T | S-605 |
| 1-Butanol | 71-36-3 | 1,000 µg/mL | 1 mL | Methanol-P&T | S-610 |
| 2-Butanol | 78-92-2 | 1,000 µg/mL | 1 mL | Methanol-P&T | S-615 |
| 2-Butanone | 78-93-3 | 1,000 µg/mL | 1 mL | Methanol-P&T | S-620 |
| Butyl acetate | 123-86-4 | 1,000 µg/mL | 1 mL | Methanol-P&T | S-635 |
| 2,2-Dimethylbutane | 73-85-2 | 1,000 µg/mL | 1 mL | Methanol-P&T | S-1614 |
| 2,3-Dimethylbutane | 79-29-8 | 1,000 µg/mL | 1 mL | Methanol-P&T | S-1615 |
| Ethane | 74-84-0 | 1,000 µg/mL | 1 mL | Methanol-P&T | S-1880 |
| Ethanol | 64-17-5 | 1,000 µg/mL | 1 mL | Methanol-P&T | S-1885 |
| Ether | 60-29-7 | 1,000 µg/mL | 1 mL | Methanol-P&T | S-1900 |
| Ethyl acetate | 141-78-6 | 1,000 µg/mL | 1 mL | Methanol-P&T | S-1920 |
| Ethyl formate | 109-94-4 | 1,000 µg/mL | 1 mL | Methanol-P&T | S-4279 |
| Ethylbenzene | 100-41-1 | 1,000 µg/mL | 1 mL | Methanol-P&T | S-1940A |
| n-Heptane | 142-82-5 | 1,000 µg/mL | 1 mL | Methanol-P&T | S-2125 |
| n-Hexane | 110-54-3 | 1,000 µg/mL | 1 mL | Methanol-P&T | S-2190 |
| Isobutyl acetate | 110-19-0 | 1,000 µg/mL | 1 mL | Methanol-P&T | S-2274 |
| Isopropyl acetate | 108-21-4 | 1,000 µg/mL | 1 mL | Methanol-P&T | S-2305 |
| Isopropylbenzene | 98-82-8 | 1,000 µg/mL | 1 mL | Methanol-P&T | S-2315 |
| Methane | 74-82-8 | 1,000 µg/mL | 1 mL | Methanol-P&T | S-2379 |
| Methanol | 67-56-1 | 1,000 µg/mL | 1 mL | Water | S-2380 |
| 3-Methyl-1-butanol | 123-51-3 | 1,000 µg/mL | 1 mL | Methanol-P&T | S-2579 |
| 2-Methyl-1-propanol | 78-83-1 | 1,000 µg/mL | 1 mL | Methanol-P&T | S-2585 |
| 4-Methyl-2-pentanone | 108-10-1 | 1,000 µg/mL | 1 mL | Methanol-P&T | S-2600 |
| Methyl acetate | 79-20-9 | 1,000 µg/mL | 1 mL | Methanol-P&T | S-3893 |
| Methyl tertiary-butyl ether | 1634-04-4 | 1,000 µg/mL | 1 mL | Methanol-P&T | S-2455 |
| 2-Methylbutane | 78-78-4 | 1,000 µg/mL | 1 mL | Methanol-P&T | S-2462 |
| Methylene chloride | 75-09-2 | 1,000 µg/mL | 1 mL | Methanol-P&T | S-2480 |
| 3-Methylpentane | 96-14-0 | 1,000 µg/mL | 1 mL | Methanol-P&T | S-2530 |
| 2-Methylpropane | 75-28-5 | 1,000 µg/mL | 1 mL | Methanol-P&T | S-2555 |

| Residual Solvents (continued) | | | | | |
|---|---|---|---|---|---|
| **Component** | **CAS #** | **Concentration** | **Volume** | **Matrix** | **Part #** |
| n-Pentane | 109-66-0 | 1,000 µg/mL | 1 mL | Methanol-P&T | S-2975 |
| 1-Pentanol | 71-41-0 | 1,000 µg/mL | 1 mL | Methanol-P&T | S-2980 |
| 1-Propanol | 71-23-8 | 1,000 µg/mL | 1 mL | Methanol-P&T | S-3160 |
| Propane | 74-98-6 | 1,000 µg/mL | 1 mL | Methanol-P&T | S-3145 |
| 2-Propanol | 67-63-0 | 1,000 µg/mL | 1 mL | Methanol-P&T | S-3165 |
| Propyl acetate | 109-60-4 | 1,000 µg/mL | 1 mL | Methanol-P&T | S-3204 |
| m-Xylene | 108-38-3 | 1,000 µg/mL | 1 mL | Methanol-P&T | S-3830 |
| o-Xylene | 95-47-6 | 1,000 µg/mL | 1 mL | Methanol-P&T | S-3835 |
| p-Xylene | 106-42-3 | 1,000 µg/mL | 1 mL | Methanol-P&T | S-3840 |
| Xylene (mix of isomers) | 1330-20-7 | 1,000 µg/mL | 1 mL | Methanol-P&T | S-3845 |

| Residual Solvent Mix in Dimethyl Sulfoxide | | | | | |
|---|---|---|---|---|---|
| **Component** | **CAS #** | **Component** | **CAS #** | **Component** | **CAS #** |
| Acetone | 67-64-1 | Ethyl acetate | 141-78-6 | 4-Methyl-2-pentanone | 108-10-1 |
| Anisole | 100-66-3 | Ethyl formate | 109-94-4 | Methyl acetate | 79-20-9 |
| 1-Butanol | 71-36-3 | n-Heptane | 142-82-5 | Methyl tertiary-butyl ether | 1634-04-4 |
| 2-Butanol | 78-92-2 | Isobutyl acetate | 110-19-0 | n-Pentane | 109-66-0 |
| 2-Butanone | 78-93-3 | Isopropyl acetate | 108-21-4 | 1-Pentanol | 71-41-0 |
| Butyl acetate | 123-86-4 | Isopropylbenzene | 98-82-8 | 1-Propanol | 71-23-8 |
| Ethanol | 64-17-5 | 3-Methyl-1-butanol | 123-51-3 | 2-Propanol | 67-63-0 |
| Ether | 60-29-7 | 2-Methyl-1-propanol | 78-83-1 | Propyl acetate | 109-60-4 |

| Concentration | Volume | Part # |
|---|---|---|
| 1,000 µg/mL | 1 mL | USP-RS-C3A |

| Arkansas Cannabis Residual Solvent Mix 3 in N,N-Dimethylacetamide | | | | | |
|---|---|---|---|---|---|
| **Component** | **Concentration** | **CAS #** | **Component** | **Concentration** | **CAS #** |
| n-Butane | 5,000 µg/mL | 106-97-8 | Ethylene oxide | 50 µg/mL | 75-21-8 |
| 2-Methylpropane | 5,000 µg/mL | 75-28-5 | Propane | 2,000 µg/mL | 74-98-6 |

| Volume | Part # |
|---|---|
| 1 mL | RS-AR-3 |

## Arkansas Cannabis Residual Solvent Mix 1 in N,N-Dimethylacetamide

| Component | CAS # | Component | CAS # |
|---|---|---|---|
| Isopropyl acetate | 108-21-4 | 2-Methylbutane | 78-78-4 |
| n-Pentane | 109-66-0 | 2-Propanol (Isopropanol, Isopropyl alcohol) | 67-63-0 |
| Ether | 60-29-7 | 2-Butanol | 78-92-2 |
| n-Heptane | 142-82-5 | 2-Butanone | 78-93-3 |
| Ethanol | 64-17-5 | 1-Pentanol | 71-41-0 |
| Ethyl acetate | 141-78-6 | 1-Propanol | 71-23-8 |
| Acetone | 67-64-1 | 1-Butanol | 71-36-3 |
| Methyl sulfoxide | 67-68-5 | | |

| Concentration | Volume | Part # |
|---|---|---|
| 5,000 µg/mL | 1 mL | RS-AR-1 |

## Arkansas Cannabis Residual Solvent Mix 2 in Dimethyl Sulfoxide

| Component | Concentration | CAS # | Component | Concentration | CAS # |
|---|---|---|---|---|---|
| m-Xylene | 2,170 µg/mL | 108-38-3 | Methylene chloride | 600 µg/mL | 75-09-2 |
| p-Xylene | 2,170 µg/mL | 106-42-3 | Ethylbenzene | 2,170 µg/mL | 100-41-4 |
| 1,2-Dimethoxyethane | 100 µg/mL | 110-71-4 | Isopropylbenzene | 70 µg/mL | 98-82-8 |
| o-Xylene | 2,170 µg/mL | 95-47-6 | Cyclohexane | 3,880 µg/mL | 110-82-7 |
| Toluene | 890 µg/mL | 108-88-3 | Acetonitrile | 410 µg/mL | 75-05-8 |
| Tetramethylene sulfone | 160 µg/mL | 126-33-0 | Benzene | 2 µg/mL | 71-43-2 |
| Tetrahydrofuran | 720 µg/mL | 109-99-9 | 2,3-Dimethylbutane | 290 µg/mL | 79-29-8 |
| Dimethylformamide | 880 µg/mL | 68-12-2 | 3-Methylpentane | 290 µg/mL | 96-14-0 |
| Pyridine | 200 µg/mL | 110-86-1 | 2-Methylpentane | 290 µg/mL | 107-83-5 |
| n-Hexane | 290 µg/mL | 110-54-3 | 2,2-Dimethylbutane | 290 µg/mL | 75-83-2 |
| N,N-Dimethylacetamide | 1,090 µg/mL | 127-19-5 | 1,4-Dioxane | 380 µg/mL | 123-91-1 |
| Ethylene glycol | 620 µg/mL | 107-21-1 | 2-Ethoxyethanol | 160 µg/mL | 110-80-5 |
| Methanol | 3,000 µg/mL | 67-56-1 | | | |

| Volume | Part # |
|---|---|
| 1 mL | RS-AR-2 |

# Heavy Metal Standards for Cannabis Testing

States are pushing for the cannabis industry to provide accurate, quantifiable results for heavy metals, specifically arsenic, cadmium, lead, and mercury for cannabis inhalation products and cannabis goods (i.e. edibles). California and Colorado have mandated the testing of cannabis for dangerous elemental impurities. The procedure focuses on the use of ICP-MS instrumentation, along with accurate ICP-MS standards, and allows for increased efficiency and accuracy of the analysis necessary to comply with the new state regulations.

Our extensive experience in creating quality trace metal standards, coupled with our ICP-MS analysis, will ensure your company will remain compliant with the new and changing regulations.

Inhalants are a well proven method for drug delivery first reported in the early 20th century. Inhalation therapy has become a mainstay in respiratory care since the inhaled drugs are localized to the target organs, which is not the case in injectable therapies. Since inhaled compounds are concentrated in the target organs, it also means that any contaminants are also concentrated in the lungs as well.

| Inhalation Metal Mix for Cannabis Metal Analysis | | | | |
|---|---|---|---|---|
| **Element** | **Concentration** | **Volume** | **Matrix** | **Part #** |
| Arsenic | 2 mg/kg | 125 mL | 5% $HNO_3$ | CANN-INHL1 |
| Cadmium | 2 mg/kg | | | |
| Lead | 5 mg/kg | | | |
| Mercury | 1 mg/kg | | | |

| Impurities Metal Mix for Cannabis Metal Analysis | | | | |
|---|---|---|---|---|
| **Element** | **Concentration** | **Volume** | **Matrix** | **Part #** |
| Arsenic | 15 mg/kg | 125 mL | 5% $HNO_3$/1% HCl | CANN-EDBIL |
| Cadmium | 5 mg/kg | | | |
| Lead | 5 mg/kg | | | |
| Mercury | 30 mg/kg | | | |

| Heavy Metal Standards | | | | |
|---|---|---|---|---|
| **Element** | **Concentration** | **Volume** | **Matrix** | **Part #** |
| Arsenic | 1,000 µg/mL | 125 mL | 2% $HNO_3$ | PLAS2-2Y |
| Cadmium | 1,000 µg/mL | 125 mL | 2% $HNO_3$ | PLCD2-2Y |
| Chromium | 1,000 µg/mL | 125 mL | 2% $HNO_3$ | PLCR2-2Y |
| Lead | 1,000 µg/mL | 125 mL | 2% $HNO_3$ | PLPB2-2Y |
| Mercury | 1,000 µg/mL | 125 mL | 10% $HNO_3$ | PLHG4-2Y |
| Nickel | 1,000 µg/mL | 125 mL | 2% $HNO_3$ | PLNI2-2Y |
| Silver | 1,000 µg/mL | 125 mL | 2% $HNO_3$ | PLAG2-2Y |
| Thallium | 1,000 µg/mL | 125 mL | 2% $HNO_3$ | PLTL2-2Y |

| Oral Elemental Impurities Mix A | | | | |
|---|---|---|---|---|
| **Element** | **Concentration** | **Volume** | **Matrix** | **Part #** |
| Arsenic | 1.5 mg/kg | 125 mL | 5% $HNO_3$ | USP-TXM2 |
| Cadmium | 25 mg/kg | | | |
| Lead | 5 mg/kg | | | |
| Mercury | 15 mg/kg | | | |

| Heavy Metals Testing Kit | | | | |
|---|---|---|---|---|
| **Element** | **Concentration** | **Volume** | **Matrix** | **Part #** |
| Arsenic | 1,000 µg/mL | 30 mL | 2% $HNO_3$ | SPXHM-KIT |
| Cadmium | | | 2% $HNO_3$ | |
| Chromium | | | 2% $HNO_3$ | |
| Lead | | | 2% $HNO_3$ | |
| Mercury | | | 10% $HNO_3$ | |